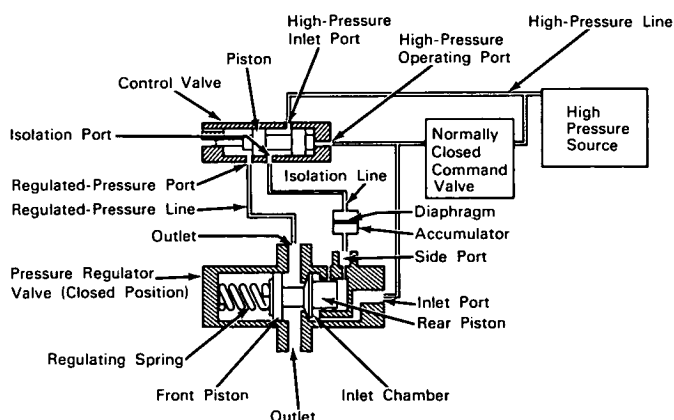


# NASA TECH BRIEF

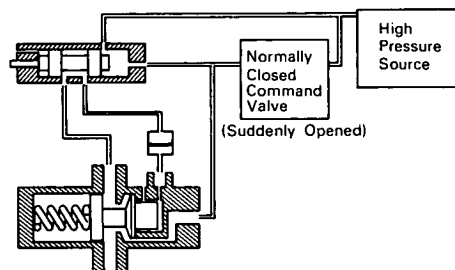


This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

## High-Pressure Regulating System Prevents Pressure Surges



INOPERATIVE CONDITION



OPERATIVE CONDITION

**The problem:** To control gas flow by means of a pressure regulating system which prevents pressure surges. The system (1) must maintain a constant downstream pressure while the upstream pressure decreases from a very high initial pressure; (2) may remain inactive for long periods of time, then be brought into operation by sudden release of the source pressure without producing damaging pressure surges; and (3) must be adjusted to a wide range of pressures and other operating characteristics.

**The solution:** A pressure regulating system, including a source of high-pressure fluid; a special spring-loaded fluid-damped regulator valve; an accumulator; a conventional normally closed command valve; and a conventional control valve.

**How it's done:** The pressure regulator valve is held in its closed position by pressure applied through the diaphragm in the accumulator against the right-hand face of the rear piston, as indicated in the schematic of the inoperative condition. To introduce the desired high pressure into the system, the normally closed command valve is opened. This action simultaneously causes the piston in the control valve to move to the left, as shown in the operative condition, and pressure to be applied to the inlet chamber of the regulator valve. As the piston moves, pressure is bled from the top of the accumulator through the isolation line, back through the central chamber of the control valve, and through the regulated-pressure line to the downstream side of the regulator valve. As a

(continued overleaf)

result, pressure is relieved from the fluid against the right-hand face of the piston in the regulator valve, permitting the spring to open the regulator valve and initiate its operation.

Regulated pressure is applied through the regulated pressure line, regulated pressure port, isolation port, and isolation line to the diaphragm (in the accumulator), so that the effective pressure behind the rear piston in the regulator valve is also the regulated pressure. As a consequence, the regulated pressure operates on the entire area of the front piston in the regulator valve against the force of the regulating spring.

The pressure at the inlet chamber does not affect the operation of the regulator valve because the effective area of the rear piston corresponds to the effective area of the valve-seat ring. If the source of high pressure is not continually replenished, the intake pressure gradually decreases as the demand continues; however, the regulated pressure tends to remain constant until the inlet pressure has fallen to substantially equal value.

Movement of fluid through the orifice between the accumulator and the regulator valve damps movement of the piston (in the regulator valve) to prevent

pressure surges in the system and vibration resonances within the regulator valve.

The regulator valve and valve-seat elements may be readily removed to change the effective port areas and thereby change the operating characteristics (e.g., pressure range) of the system.

**Note:**

1. For further information about this innovation inquiries may be directed to:

Technology Utilization Officer  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B63-10170

**Patent status:** NASA encourages the commercial use of this invention. It has been patented by NASA (U.S. Patent No. 3,105,515), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA Headquarters, Washington, D.C. 20546.

Source: Orville F. Keller and William F. MacGlashan  
(JPL-231)